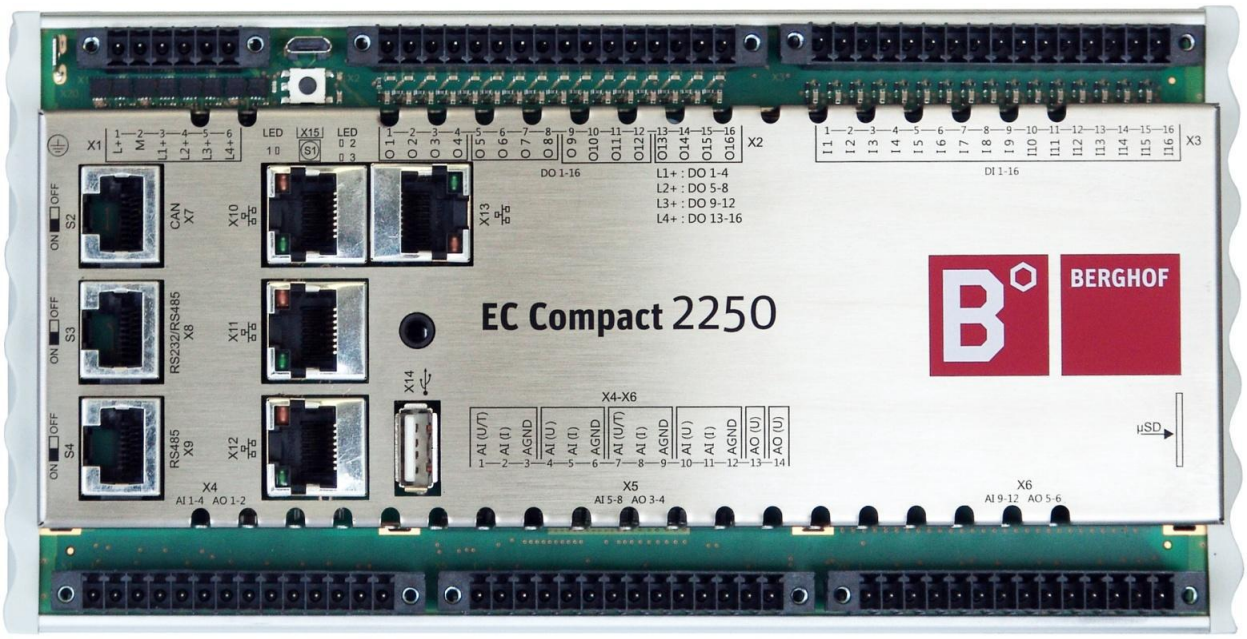
USER MANUAL 1.0

ECC22XX
Ethernet Controller Compact



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Notes on this handbook
This equipment manual contains information which is specific to the product and which is valid at the time of printing.
This equipment manual is only complete in conjunction with the product-related hardware and software user manuals required for the individual application.

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1. General information

This user handbook is intended for use by qualified professionals and contains information on the assembly, installation, start-up and maintenance of the device.

1.1. Notes on the handbook

This user handbook is part of the product.
It contains information on the following topics:

- → Applications
- → Safety
- → Mechanical design
- → Electrical design
- → Connections
- → Start-up
- → Upkeep and maintenance
- → Decommissioning
- → Disposal

▶ Always keep this user handbook available alongside the product.

1.2. Symbols and visual depictions

The following symbols and visual depictions will be used in this handbook:

Symbol	Meaning
→ …	List entry
▶ …	Individual instruction or list of instructions which can be carried out in any order.
1. … 2. …	List of instructions which must be carried out in the order given.
	Additional product information

Design of warnings:

⚠ WARNING
Optional: additional symbols

Danger type and source

Short description and possible consequences

▶ Preventive measures

1.3. Hazard categories and indications

The following indications are used in the case of warning messages so as to ensure your personal safety and avoid any damage to property.

The indications have the following meanings:

DANGER	**Serious injury or death** Non-compliance with the safety features will result in death or serious injury. ▶ Take preventive measures.
WARNING	**Possible serious injury or death** Non-compliance with the safety features may result in death or serious injury. ▶ Take preventive measures.
CAUTION	**Possible minor injuries** Non-compliance with the safety features may result in minor injuries. ▶ Take preventive measures.
NOTICE	**Possible damage to property** Non-compliance with the safety features may result in damage to property. ▶ Take preventive measures.

Further information

1.4. Qualified personnel

The installation, start-up and maintenance of the device must be carried out by qualified personnel.
For the purposes of this documentation and the safety instructions contained therein, “qualified personnel” means trained staff with the authorisation to assemble, install, start up, earth and identify devices, systems and electrical circuits in accordance with standards set in safety engineering and who are familiar with safety concepts in automation engineering.

1.5. Duty of care

The user or processor (OEM) must ensure the following:

- → The device must only be used according to regulations.
- → The device must only be used in good working order.
- → The user handbook must always be kept legible and fully available.
- → Only sufficiently qualified and authorised personnel may carry out the assembly, installation, start-up and maintenance of the device.
- → This authorised personnel must receive regular training on all relevant occupational health and safety and environmental protection issues and must be fully familiar with the content of this user handbook, particularly the sections regarding safety features.
- → Any markings or identification labels and safety and warning signs on the device must not be removed and must be kept legible at all times.
- → The national and international regulations regarding the operating of machinery and facilities where the device is being used must be observed at all times.
- → The user must always be kept abreast of any current relevant information regarding the device and its use or operation.

1.6. Intended use

The ECC22XX is a modular automation system for industrial control applications within the medium to high performance range.

The automation system is designed for use within overvoltage category I (IEC 364-4-443) systems for the controlling and regulating of machinery and industrial processes in low-voltage installations in accordance with the following general parameters:

- → maximum rated supply voltage of 1,000 V AC (50/60 Hz) or 1,500 V DC;
- → for use in maximum category 2 pollution environment (EN 60950)
- → for use up to a maximum altitude of 2,000 m
- → for indoor use only.

Qualified project planning and design, proper transport, storage, installation, use and careful maintenance are essential to the flawless and safe operation of the automation system.
The automation system may only be used within the scope of the data and applications specified in this documentation and associated user manuals.

The automation system must only be used:

- → as intended;
- → in a technically perfect condition;
- → without unauthorised modifications;
- → by qualified users.

- ▶ Observe the rules of the employer's liability insurance association, the technical inspectorate, and the VDE (Association of German electricians) or corresponding country regulations.

2. Safety

Safety-related systems
The use of PLC in safety-related systems requires specific measures. Wherever a PLC is to be used in a safety-related system, the user must be given comprehensive advice by the PLC manufacturer in addition to information on any available standards or regulations regarding safety installations.

- Before starting any work on the device, disconnect all inputs, including peripherals.
- Keep all ventilation holes unobstructed.

3. Product description ECC22XX

The compact PLC controller ECC22XX is a CODESYS PLC for the controlling and regulating of automatic and industrial processes in low-voltage installations, e.g. for compact machinery or building automation. The programming language CODESYS 3.5 (IEC 61131-3) is used for programming the device. The CODESYS SoftMotion packet permits complex multi-axis drive applications.
The device can be connected via different interfaces and has additional digital and analogue inputs/outputs.

3.1. Overview

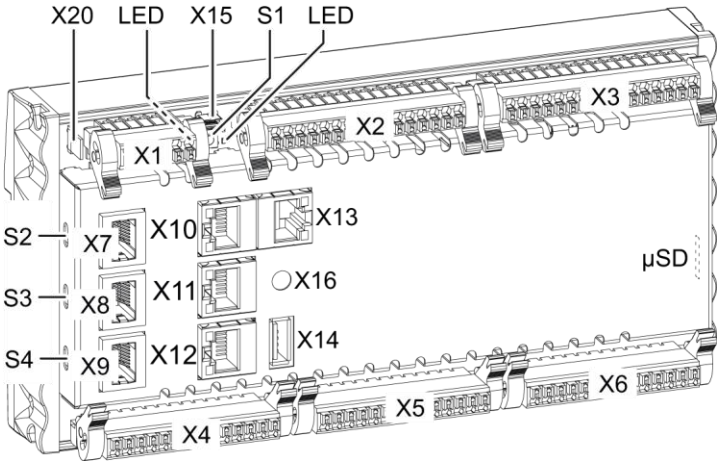

Fig. 1: Overview

Item	Description	Item	Description
X1	Electrical connection (power)	X13	EtherCAT
X2	Digital outputs	X14	USB 2.0
X3	Digital inputs	X15	(reserved)
X4	Analogue inputs and outputs	X16	Debug interface
X5	Analogue inputs and outputs	X20	Functional earth
X6	Analogue inputs and outputs	S1	Function key (Reset and Run/Stop)
X7	CAN Bus (except ECC2251)	S2	Terminal resistance CAN-Bus ON/OFF
X8	RS 232 / RS 485	S3	Terminal resistance RS 485 ON/OFF
X9	RS 485	S4	Terminal resistance RS 485 ON/OFF
X10	Ethernet	LED	LEDs for power and system status
X11	Ethernet	µSD	microSD card connection (optional)
X12	Ethernet		

3.2. Scope of delivery and accessories

Scope of delivery
Ethernet Controller ECC22XX

Accessories
Connector set ECC22XX; order no.: 201606000

3.3. Product features

Assembly
The device is designed for installation on a DIN rail (35 mm) in a control cabinet in an industrial environment with a category 2 pollution environment.

Ethernet
The device has two 10/100 Mbit/s Ethernet interfaces. TCP/IP and UDP/IP protocols permit flexible connections to visualisation software, higher-level control units and to the IT infrastructure.
One Ethernet interface can be equipped with an optional 3-switch (3 ports for the user) connected directly to the CPU.
The second Ethernet interface is connected to the controller via a PCIe.
Additional protocols are available: PROFINET, BACnet and Modbus.

USB
Thanks to the USB host interface, a wide range of peripherals can be connected to the device. Examples are a USB stick for updating the application or for downloading data directly.

CAN interfaces (except ECC2251)
The device has one standard CAN interface which can be used at a speed of up to 1 Mbit/s.

Serial interfaces
The ECC22XX has up to three potential-free serial interfaces (2x RS485; 1x RS232).

Additional interfaces
There is also a debugging interface located on the ECC22XX which can be used in conjunction with a special cable to be connected to the jack plug (for additional information, please contact our customer services team).

Real-time clock
A buffered, maintenance-free real-time clock can be set to the current time via a software interface.

microSD card (optional)
The ECC22XX has an optional microSD card slot, e.g. for downloading data. µSD cards of up to 32 GB are supported.

Visualisation
CODESYS target visualisation is included in the scope of delivery. The Berghof Ethernet terminals ET1000 and ET 2000 provide a simple, user-friendly display.
The assembly also supports web visualisation.

Summary of features

- → CPU Cortex TM-A9 single core (scalable to 800 MHz)
- → user program and data memory (RAM): 256 MB onboard
- → user program memory (Flash): 256 MB onboard / 128 MB user memory
- → Retain memory 100 kB
- → 2 Ethernet 10/100 Base T interfaces (2nd interface optional as Ethercat via Intel Controller i210)
- → 1 USB host interface V2.0 (type A)
- → 1 CAN interface (except ECC2251)
- → 3 serial interfaces (1x RS 232; 2x RS 485) for communications with other devices and system real-time clock
- → 1 µSD card slot (optional)
- → USB host 2.0 type A
- → 16 digital inputs
- → 16 digital outputs
- → 12 analogue inputs
- → 6 analogue outputs

4. Assembly

The EC compact devices are designed to be installed on support rails (according to EN 60715:2001, 35 x 7.5 mm).

⚠ CAUTION

Danger of burns!

The surface of the device can become hot.

- ▶ Ensure that there is sufficient convectional cooling for heat to dissipate.
- ▶ Ensure that there is also a minimum of 50 mm free space both above and below the device.

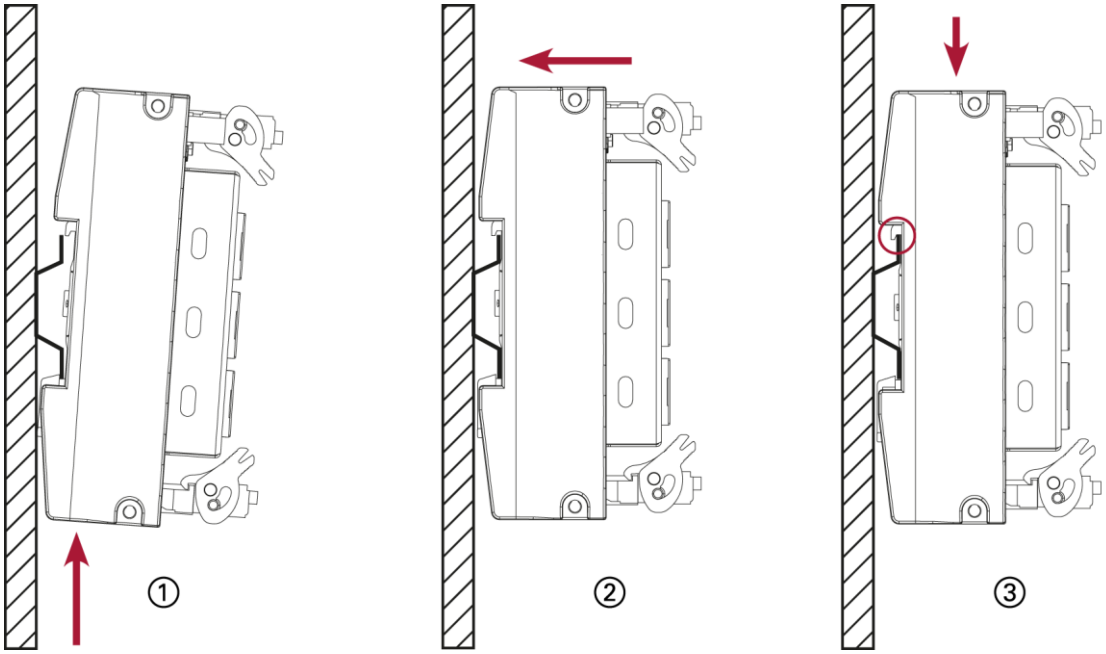

Fig. 2: assembling the device

Requirements:

→ at least 1 cm free space must be left between the device and the adjacent module.

1. Insert the device into the support rail according to the image above so that the plastic snap-in hooks between the mounting surface and the rail are pressed in.
2. Push the device at the top in towards the mounting surface.
3. Push the device down so that the profile is aligned with the upper part of the rail mounting.

The device should now be fixed in place.

5. Connection

⚠ WARNING	**Uncontrolled and unpredictable operational sequences!** Failure in certain components in electronic control systems may result in uncontrolled and unpredictable operational sequences. ▶ All types of failure and the associated fuse systems are to be taken into account at system level. ▶ Comply with all automation system manufacturer instructions.

5.1. Power supply

The device is powered by an external 24 V DC supply. It is not designed to be connected to the DC mains supply.

▶ Before plugging in the device, ensure it meets the specifications for external power supplies (type K according to 61131-2).

External PLC power supply (24 V DC: L+; L1+; L2+; L3+; L4+)	
Supply voltage	+24 V DC SELV (–15% / +20%)
Alternating current proportion	Max. 5% The direct voltage level must not fall below 20.4 V.
Energy buffering	Power fail 10 ms

Internal power supply
A power supply for the system electronics for an input voltage of 24 V DC (–15% / +20%) is integrated into the device. The power supply has integrated protection against reverse polarity and surge current protection (1.2 A).

▶ Fuse the supply lines for the IO lines (L1+ to L4+) externally so that the value (approx. 5 A) for the power-limited electrical circuits (150/U) are not exceeded (U = value of the voltage applied).

Installation
▶ All connections and cables must be laid out so as to prevent inductive and capacitive interference causing any damage to the device.
▶ Ensure that the infeed lines provide adequate current and voltage carrying capacity.

Connecting the power supply

CAUTION

Live parts!

- ▶ Before starting any work on the device, disconnect all inputs, including any connected peripherals.

- ▶ Connect the power supply to plug X1 according to the following table.

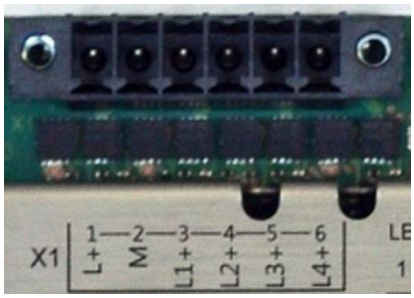

Fig. 3: power supply plug X1

Power supply plug X1		
Pin	**Label**	**Assignment**
1	L+	external 24 V DC (–15% / +20%) power supply (internal PLC) max. 1 A
2	M	external GND power supply
3	L1+	Digital output DO1–4 supply, 24 V DC (–20% / +25%) max. 2 A [1]
4	L2+	Digital output DO5–8 supply, 24 V DC (–20% / +25%) max. 2 A [1]
5	L3+	Digital output DO9–12 supply, 24 V DC (–20% / +25%) max. 2 A [1]
6	L4+	Digital output DO13–16 supply, 24 V DC (–20% / +25%) max. 2 A [1]

[1] Nominal current 2 A at peak load; in case of overload, up to 3 A might flow.

5.2. Earth

The functional earth dissipate HF currents and increase the stability of the device.
HF faults are transferred internally from the electronic circuit board to the metallic housing which requires a suitable connection to a functional earth (X20).

Earthing the ECC22XX

Requirements:
→ The support rail has a good conductive contact with the control cabinet.
→ The control cabinet must be earthed correctly.

▶ Ensure that the device housing has good conductive contact with the support rail.
▶ If specifically required in certain installations, additional PE conductors may be connected to protect all metallic parts from high voltages on the underside of the device (PE connection).

The device is now earthed.

Where necessary, the device can also be connected directly to the earth.

5.3. Data connections

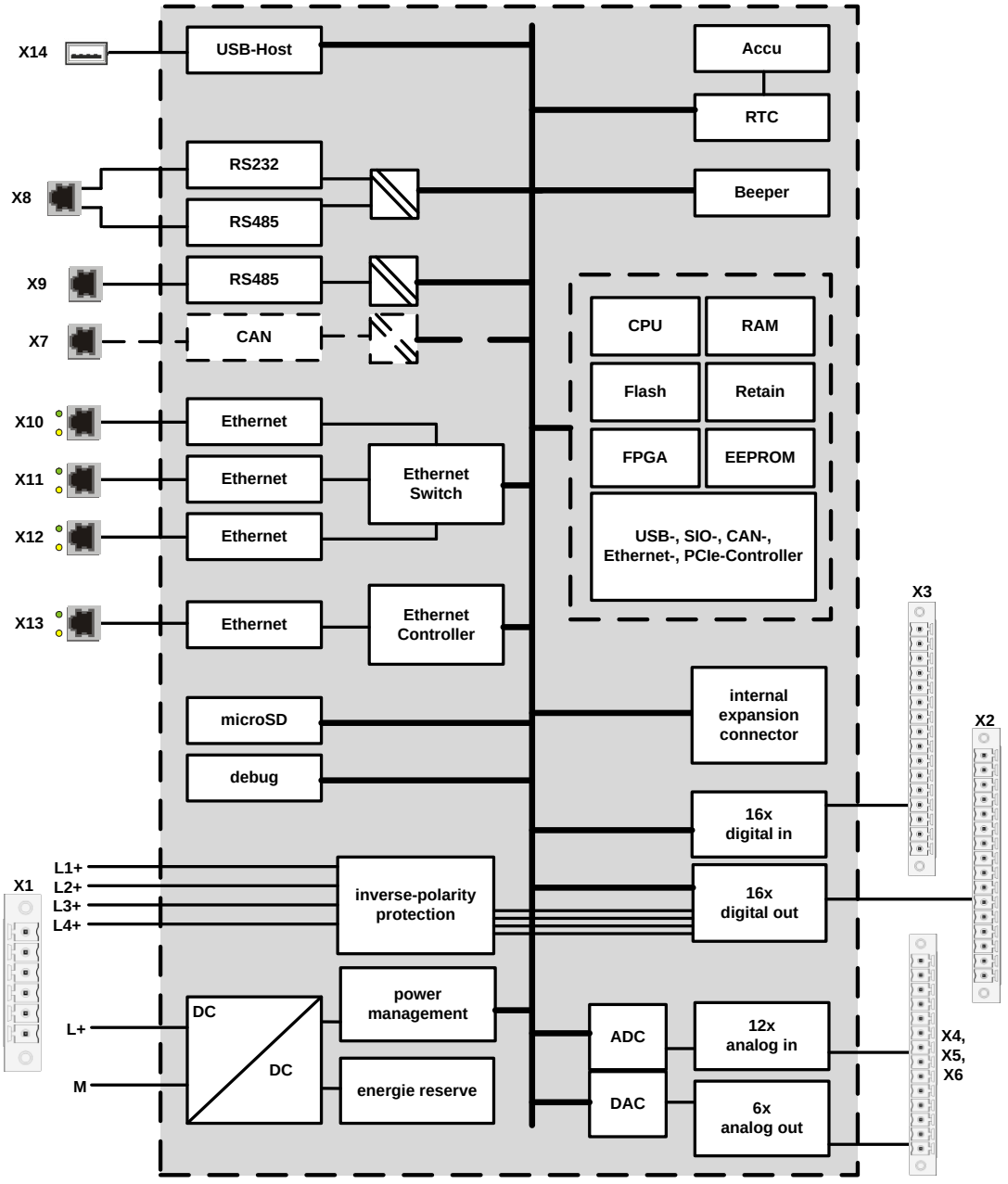

Fig. 4: block diagram

5.3.1. Digital outputs (O)

The digital outputs are positive switching 24 V outputs with an output current of max. 500 mA. They have a common reference potential (GND) with the supply voltage. The supply lines are organised into four groups of four.

The following counterpieces have been tested for the SC-SMT 3.81 (Weidmüller) plug-in connector and are approved for use with the ECC22XX:

→ Weidmüller BCZ 3.81/16/180 (F, LH)
→ Weidmüller BCF 3.81/16/180 (F, LH)
→ Phoenix FK-MCP 1.5/16-ST-3.81-LR

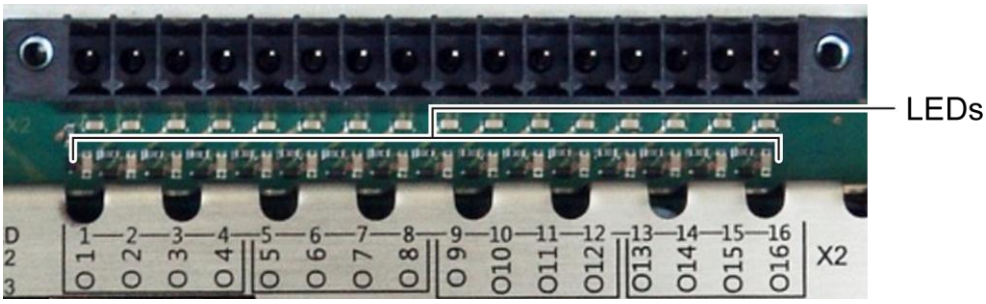

Fig. 5: digital outputs plug X2 (Weidmüller SC-SMT 3.81/16/180 LF 3.2)

Digital outputs plug X2		
Pin	**Label**	**Assignment**
1	O 1	+24 V (supply from L1+)
2	O 2	
3	O 3	
4	O 4	
5	O 5	+24 V (supply from L2+)
6	O 6	
7	O 7	
8	O 8	
9	O 9	+24 V (supply from L3+)
10	O 10	
11	O 11	
12	O 12	
13	O 13	+24 V (supply from L4+)
14	O 14	
15	O 15	
16	O 16	

The maximum output current is 0.5 A and the output stage is protected against overload.

▶ Take possible limitation of the output current when connecting external devices (e.g. increased surge current from lamps) into account.

Data from the digital outputs		
Feature	**Value**	**Description**
Output type	semiconductor	non-storing
Protective circuit for inductive loads	41 V terminal voltage (typ.) compared to +24 V	fast de-excitation (must be provided externally)
Status display	yes	one orange LED per output
Overload protection	yes	in the case of thermal overload
Short circuit protection response threshold	yes	electronic voltage limitation: typ. 7 A The electricity is limited electronically. Activation of short circuit protection results in thermal overload and tripping of thermal overload protection. Permissible limits based on cold state: max. 10,000 short circuits; overall duration max. 500 hours.
Output delay “0” after “1”	typ. 1 ms	–
Output delay “1” after “0”	typ. 1 ms	–
Output capacity	< 20 nF	–
Rated voltage	+24 V DC	–
Voltage drop (at rated current)	< 0.1 V	–
Rated current at “1” signal	0.5 A	–
Total current of all outputs	max. 2 A per group	group: 4 adjacent pins with supply from same source (e.g. pins 1-4, power supply L1+)
Parallel circuit in two outputs	max. 1 A	maximum permissible value with a logical connection to increase performance

5.3.2. Digital inputs (I)

The digital inputs are type 1 or 3 (IEC61131-2) positive switching inputs. They are designed for nominal input voltages of 24 V. The inputs are transferred internally for process data processing in a cyclical fashion. An open input is interpreted as static 0.

The following counterpieces have been tested for the SC-SMT 3.81 (Weidmüller) plug-in connector and are approved for use with the ECC22XX:

→ Weidmüller BCZ 3.81/16/180 (F, LH, LR)
→ Weidmüller BCF 3.81/16/180 (F, LH, LR)
→ Phoenix FK-MCP 1,5/16-ST-3.81-LR

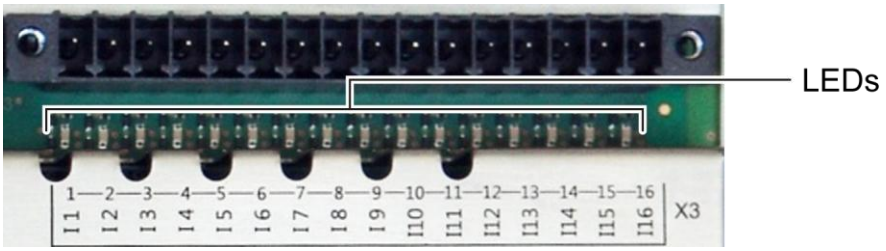

Fig. 6: digital inputs plug X3 (Weidmüller SC-SMT 3.81/16/180 LF 3.2)

Digital outputs plug X2		
Pin	**Label**	**Assignment**
1	I 1	+24 V
2	I 2	+24 V
3	I 3	+24 V
4	I 4	+24 V
5	I 5	+24 V
6	I 6	+24 V
7	I 7	+24 V
8	I 8	+24 V
9	I 9	+24 V
10	I 10	+24 V
11	I 11	+24 V
12	I 12	+24 V
13	I 13	+24 V
14	I 14	+24 V
15	I 15	+24 V
16	I 16	+24 V

Data from the digital inputs		
Feature	**Value**	**Description**
Cable length	max. 30 m	For unshielded connection cables Cables over 30 m in length must be shielded
Cable cross-section in control cabinet	after voltage drop	▶ Only select after voltage drop (there are no further practical restraints).
Field wiring	according to regulations and standards	▶ Comply with all local regulations and the stipulations of EN 61131-2.
Rated load voltage	24 V DC (SELV)	–
Protection against reverse polarity	yes	–
Potential isolation	no	–
Status display	yes	One orange LED per input

5.3.3. Analogue inputs and outputs (AIO)

The ECC22XX has up to 12 analogue inputs (AI) and 6 analogue outputs (AO) on plugs X4, X5 and X6. The layout of the I/O is identical on all 3 plugs.

The following counterpieces have been tested for the SC-SMT 3.81 (Weidmüller) plug-in connector and are approved for use with the ECC22XX:

→ Weidmüller BCZ 3.81/14/180 (F, LH, LR)
→ Weidmüller BCF 3.81/14/180 (F, LH, LR)
→ Phoenix FK-MCP 1,5/14-ST-3.81-LR

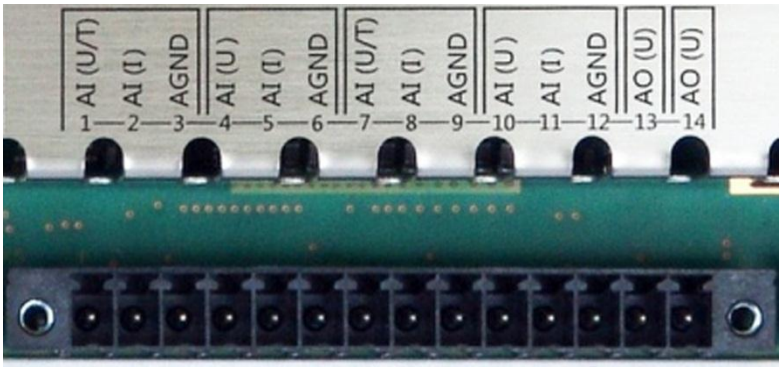

Fig. 7: analogue inputs and outputs plugs X4, X5 and X6 (Weidmüller SC-SMT 3.81/14/180 LF 3.2)

Analogue inputs and outputs plugs X4, X5 and X6				
Pin	**X4**	**X5**	**X6**	**Assignment**
1	AI 1	AI 5	AI 9	U/T; ±10 V; PT100/1000
2	AI 1	AI 5	AI 9	I; ±20 mA
3	–	–	–	AGND
4	AI 2	AI 6	AI 10	U; ±10 V
5	AI 2	AI 6	AI 10	I; ±20 mA
6	–	–	–	AGND
7	AI 3	AI 7	AI 11	U/T; ±10 V; PT100/1000
8	AI 3	AI 7	AI 11	I; ±20 mA
9	–	–	–	AGND
10	AI 4	AI 8	AI 12	U; ±10 V
11	AI 4	AI 8	AI 12	I; ±20 mA
12	–	–	–	AGND
13	AO 1	AO 3	AO 5	U; 0–10 V
14	AO 2	AO 4	AO 6	U; 0–10 V

Analogue channel wiring

Ensure the following connection requirements are met so as to guarantee the measuring accuracy of the device:

- Use analogue cables with a braided shield.
- Separate the laying of analogue cables and power cables. Where required, install metallic shielding in cable channels.
- Earth the screen at the place where it enters the control cabinet.
- Connect the screen close and directly with AGND.

Data from analogue inputs

Data from analogue inputs		
Feature	**Value**	**Description**
Cable length	max. 30 m	Only valid for unshielded connection cables Cables over 30 m in length must be shielded
Modulation method	Delta-sigma modulation	–
Shared points between the channels	AGND reference ground	–
Calibration frequency	12 months	Maintenance of accuracy class
Clamp arrangement	Shielding on common AGND pins	–
Sampling duration/rate for measuring values	1 ms	A reading is taken from each input channel every millisecond, regardless of how many channels are actually in operation.
Sampling rate Operating mode AI-PT	250 ms	In operating mode AI-PT, calculations are carried out after the millisecond sampling rate. A new value is available in the user program every 250 ms.

Digital filtering		
Possible filter settings	**Time range for averaging**	**Time range for averaging Operating mode AI-PT**
10	10 ms	2.5 s
100	100 ms	25 s
1,000	1,000 ms (1 s)	250 s

If filtering is active, an average is calculated for the set time range. However a value is still issued during the sampling rate interval. For example, if the filter is set to 1,000, the average of the measurements for the previous 1,000 ms / 1,000 measurements is issued each millisecond (or, in the case of operating mode AI-PT, the average for the last 250 ms / 1,000 measurements).

The filtering can be activated and configured using CODESYS V3. The sampling rate is constant. It can only be filtered with a whole multiple of the sampling rate.

Operating modes for the analogue inputs

NOTICE

Damage to channel

High voltages can damage analogue channels, stopping them from working correctly.

▶ Ensure the input voltage does not exceed ±30 V.

Operating mode: voltage input AI (U)		
Feature	**Value**	**Description**
Connections per input	–	AI (U/T) and AGND or AI (U) and AGND; connect screening with AGND.
Measuring range	–10 to +10 V	–
Input impedance in signal range	100 kΩ	between AI (U/T) and AGND or between AI (U) and AGND
Max. errors at 25°C	±2,500 ppm (±25 mV)	–
Temperature coefficient	±40 ppm/K (±0.4 mV/K)	–
Digital resolution	24 bit	–
Data format in user program	32 bit real	(floating-point number) in millivolts (mV)
Maximum permissible permanent overload	Max. ±30 V compared to AGND	±30 V = max. voltage on AI channel
Output of digital value in case of overload	–	If a voltage of ±10 V is applied to an AI (U), a plausible value is still given up to approx. ±15 V. The specified accuracy is only valid for the range –10 to +10 V. From a voltage of ±16 V, the values are distorted considerably and from +23 V an error bit is set which can be queried in the application program.
Input type	–	Unsymmetrical voltage metering (single-ended)
Reference potential	AGND	–
Dynamic characteristics		
Analogue filtering	Second-grade low-pass filter; time constant T = approx. 500 µs	–
Greatest temporary	0.5% of measuring	–

Operating mode: voltage input AI (U)		
Feature	**Value**	**Description**
deviation during electrical error testing according to IEC 61131-2	range	

Operating mode: voltage input AI (I)		
Feature	**Value**	**Description**
Connections per input	–	AI (I) and AGND; connect screening with AGND.
Protection	–	Thermal current limitation
Measuring range	–20 to +20 mA	Technical current direction into AI (I)
Load impedance	typ. 20 Ω	–
Max. errors at 25°C	±2,000 ppm (±40 µA)	–
Temperature coefficient	±40 ppm/K (±0.8 µA/K)	–
Digital resolution	24 bit	–
Data format in user program	32 bit real	(floating-point number) in milliamps (mA)
Maximum permissible permanent overload	Max. ±25 mA	–
Output of digital value in case of overload	–	If a current greater than ±20 mA flows into an AI (I), a plausible value is still given up to approx. ±25 mA. The specified accuracy is only valid for the range –20 to +20 mA.
Input type	–	Current measurement compared to AGND
Reference potential	AGND	–
Dynamic characteristics		
Analogue filtering	Second-grade low-pass filter; time constant T = approx. 215 µs	–
Greatest temporary deviation during electrical error testing according to IEC 61131-2	0.5% of measuring range	–

Operating mode: temperature inputs AI-PT		
Feature	**Value**	**Description**
Connections per input	–	Sensor connection between AI (U/T) and AGND
Possible sensors	PT100 and PT1000 acc. to EN 60751	Accuracy class AA, A, B and C platinum sensors may be used; recommendation: B or C
Measuring range	–40 to +200°C	–
Measuring current (RMS)	0.3 mA	–
Conversion time	250 ms	–
Max. errors at 25°C	±2,100 ppm (±0.5°C)	–
Temperature coefficient	±50 ppm/K (±0.012°C/K)	–
Digital resolution	24 bit	–
Data format in user program	2 × 32 bit real	(floating-point number) in Ohms (Ω) and degrees Celsius (°C)
Linearisation	–	The value in degrees Celsius is calculated from the resistance value and linearised (3rd degree polynomial)
Input type	–	2-wire measurement or 3-wire measurement
Reference potential	AGND	–
Dynamic characteristics		
Analogue filtering	Second-grade low-pass filter; time constant T = approx. 500 µs	–
Greatest temporary deviation during electrical error testing according to IEC 61131-2	0.5% of measuring range	–

Data from analogue outputs

Data from analogue outputs		
Feature	**Value**	**Description**
Protection	Thermal overload protection	–
Isolation voltage between channel and other circuits	none	–
Reference potential	AGND	–
Calibration frequency	12 months	Maintenance of accuracy class
Permissible load types	no reference point; earthed	–
Largest capacitive load	10 µF	Higher capacitive loads may result in oscillation of the output.
Load impedance range	≥ 1 kΩ	–
Overload protection	Short-circuit-proof	Current limitation from approx. 22 mA (at 25°C ambient temperature)
Output response during power supply switching on and switching off processes		
No supply voltage	AI (I) to AGND: < 40 Ω	Low-resistance output
During device boot-up	–	The analogue output is not active during device boot-up. Deviations from the zero value during switching on are approx. ≤ 1.5% of the signal range (voltage connected to open output for approx. 150 ms).
During temporary interruptions	–	The analogue outputs are disconnected and low-resistance in the case of temporary interruptions to the power supply of > 10 ms.
Behaviour in stop mode		
Voltage output	–	Can be configured in CODESYS. Either the last valid value is used or 0 V is used.

Operating modes for the analogue outputs

Operating mode: voltage output AO (U)		
Feature	**Value**	**Description**
Signal range	0 to 10 V	–
Connections per output	–	AO (U) and AGND; connect screening to AGND. Screening used alongside AI channels.
Load impedance	> 1 kΩ	–
Output current	Max. 20 mA	–
Max. errors at 25°C	±2,000 ppm (±20 mV)	–
Temperature coefficient	±40 ppm/K (±0.4 mV/K)	–
Value of least significant bit (LSB)	±244 ppm (±2.44 mV)	–
Digital resolution	12 bit	–
Data format in user program	32 bit real	(floating-point number) in millivolts (mV)
Dynamic characteristics		
Build-up time for change in full range to 95% of final value	320 µs	–
Overshooting	0.1% of measuring range	–
Greatest temporary deviation during electrical error testing according to IEC 61131-2	0.5% of measuring range	–

5.3.4. Example connections of analogue inputs and outputs

Voltage input AI (U)

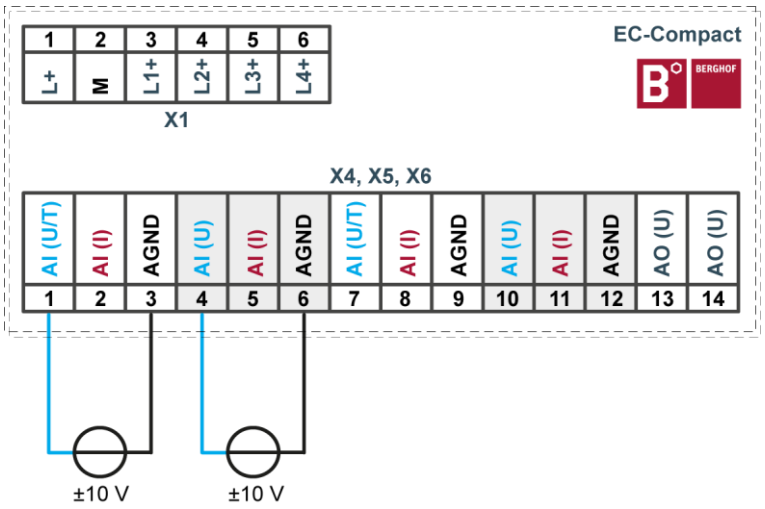
1 2 3 4 5 6
L+ M L1+ L2+ L3+ L4+
X1
EC-Compact
BERGHOF
X4, X5, X6
AI (U/T) AI (I) AGND AI (U) AI (I) AGND AI (U/T) AI (I) AGND AI (U) AI (I) AGND AO (U) AO (U)
1 2 3 4 5 6 7 8 9 10 11 12 13 14
±10 V
±10 V

Fig. 8: example connection: voltage input

- Only use the corresponding AGND for each voltage input.
- Do not connect AGNDs from different channels.
- Only use one channel per function: either AI (U) or AI (I).
- Do not connect to the common GND. The required connections can already be found on the circuit board.
- Cables to the analogue sensors/encoders should be connected as directly as possible (avoid the use of terminals and terminal blocks).

Power input AI (I)

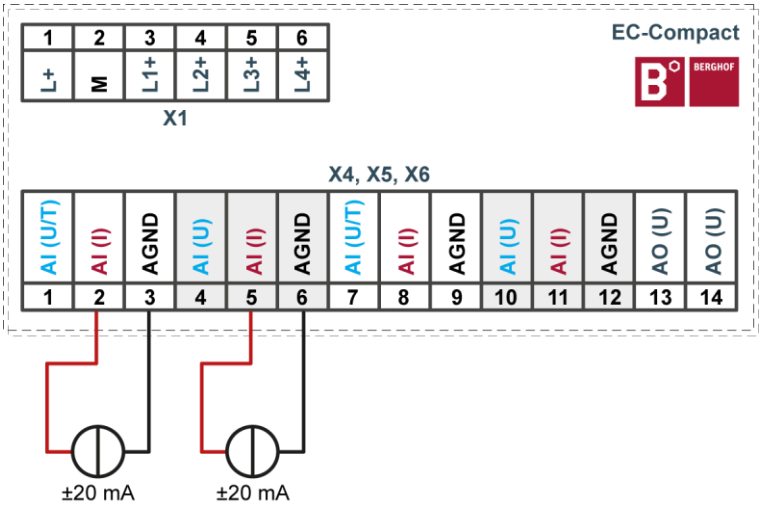

Fig. 9: example connection: power input

- Only use the corresponding AGND for each power input.
- Do not connect AGNDs from different channels.
- Only use one channel per function: either AI (U) or AI (I).
- Do not connect to the common GND. The required connections can already be found on the circuit board.
- Cables to the analogue sensors/encoders should be connected as directly as possible (avoid the use of terminals and terminal blocks).

Temperature measurement AI (T)

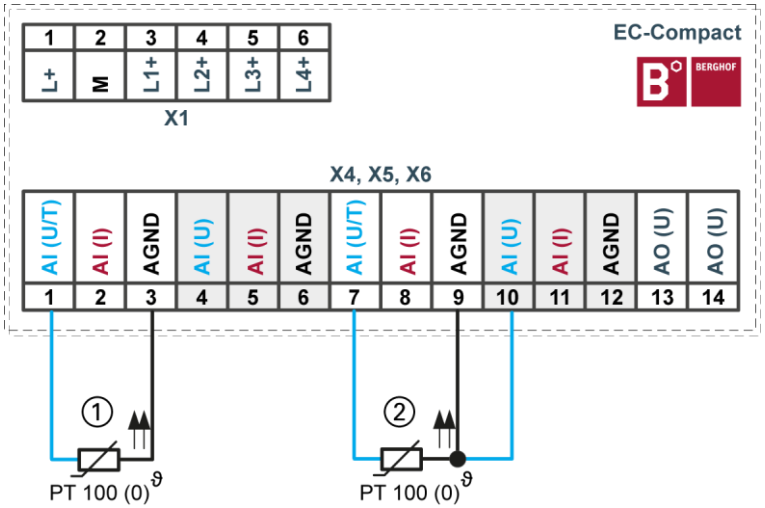
EC-Compact
1 2 3 4 5 6
L+ M L1+ L2+ L3+ L4+
X1
X4, X5, X6
AI (U/T) AI (I) AGND AI (U) AI (I) AGND AI (U/T) AI (I) AGND AI (U) AI (I) AGND AO (U) AO (U)
1 2 3 4 5 6 7 8 9 10 11 12 13 14
①
②
PT 100 (0) ϑ
PT 100 (0) ϑ

Fig. 10: example connection: temperature measurement

Item	Description
1	PT 100 with 2-wire connection
2	PT 100 with 3-wire connection

- Only use the corresponding AGND for each power input.
- Do not connect AGNDs from different channels.
- Only use one channel per function: either AI (U) or AI (I).
- Do not connect to the common GND. The required connections can already be found on the circuit board.
- Cables to the PT100(0) sensors should be connected as directly as possible (avoid the use of terminals and terminal blocks).
- Only connect PT100(0) sensors to AI (U/T) channels. Each 14-pin plug-in connector has 2 AI (U/T) channels.

2-wire measurement
Resistance can result in a measurement error, which in the case of long cables with a small cross-section can be up to 10°. If the temperature of the sensor is known, this deviation can be subtracted and this way compensated through the software (alternatively, use 3-wire measurement).

3-wire measurement
The nearest AI (U) connection is used to compensate the resistance in the cable. It can only be used directly in conjunction with the following AI (U/T) channel.

Voltage output AO (U)

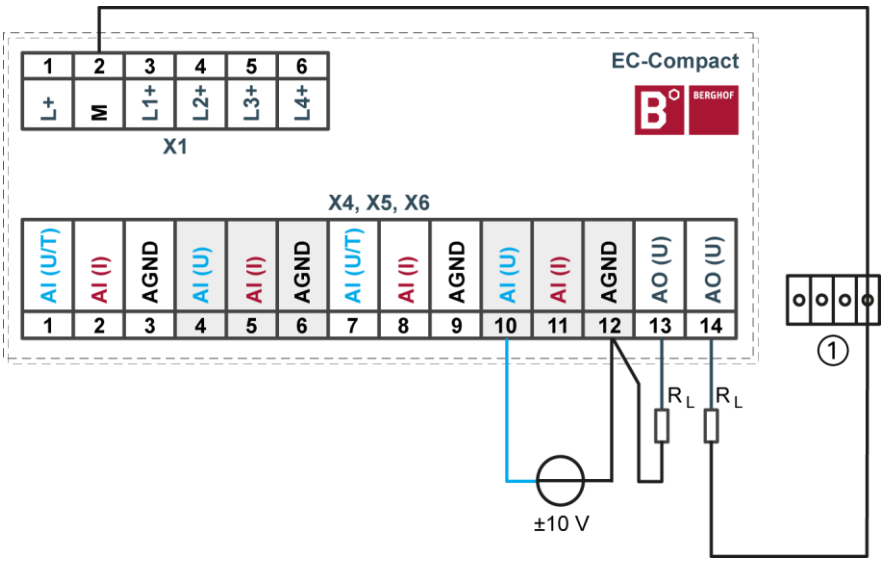

Fig. 11: example connection: voltage output

Item	Description
1	Terminal block

- Connect the voltage outputs directly to the input channel AGND.
  If direct connection to the AGND is not possible: connect the voltage input to the overall GND of the device.
- AGNDs which are also used by other input channels should not be connected to the same terminal block in order to avoid changes in the voltage to the AO (U) and the temperature value.
- Only use the corresponding AGND for each power input.
- Ensure that the cable resistance is substantially lower than the load resistance R_L so as to guarantee high measuring accuracy. Take into account the voltage divider between the load and cable resistance.

5.3.5. CAN Bus

The ECC2251 version of the device has no CAN interface. Plug X7 is not available.

Properties of the CAN interface	
Standard	ISO 11898
Maximum baud rate	1 MBit/s
Lowest adjustable baud rate	50 kBit/s
Contacts	Electrically isolated
Assignment	acc. to CiA303

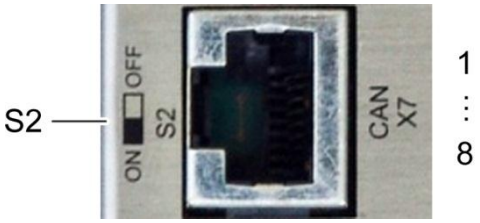

Fig. 12: CAN interface

Assignment CAN interface plug X7			
Pin	**Assignment**	**Pin**	**Assignment**
1	CAN_H	5	NC
2	CAN_L	6	NC
3	ISO GND	7	ISO GND
4	NC	8	NC

If the CAN interface is located at the start or end of the CAN bus topology:

- ► set switch S2 to ON in order to switch on the 120 Ω terminal resistance between CAN_L and CAN_H.

5.3.6. RS 485 / RS 232

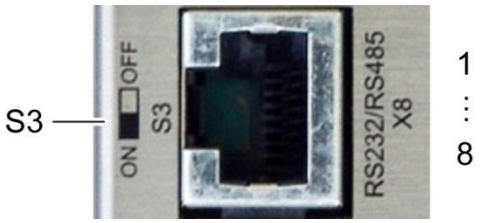

Fig. 13: RS 485 / RS 232 interface

Assignment RS 485 / RS 232 interface plug X8			
Pin	**Assignment**	**Pin**	**Assignment**
1	RS 232 RX	5	RS 485 Tx/Rx–
2	RS 232 TX	6	NC
3	NC	7	(reserved)
4	RS 485 Tx/Rx+	8	ISO GND

If the RS-485 interface is located at the start or end of the bus topology:

- ▶ set switch S3 to ON in order to switch on the 120 Ω terminal resistance between Tx/Rx+ and Tx/Rx–.

As far as possible, the assignment of the interfaces should be carried out in accordance with the specifications given in “MODBUS over Serial Line; Specification and Implementation Guide V1.02”.

5.3.7. RS 485

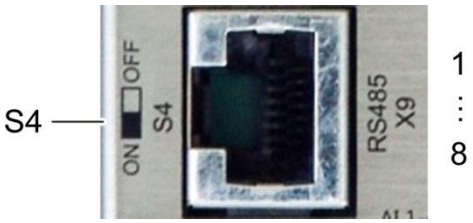

Fig. 14: RS 485 interface

Assignment RS 485 interface plug X9			
Pin	**Assignment**	**Pin**	**Assignment**
1	NC	5	RS 485 Tx/Rx–
2	NC	6	NC
3	NC	7	(reserved)
4	RS 485 Tx/Rx+	8	ISO GND

If the RS-485 interface is located at the start or end of the bus topology:

- ► Set switch S4 to ON in order to switch on the 120 Ω terminal resistance between Tx/Rx+ and Tx/Rx–.

As far as possible, the assignment of the interfaces should be carried out in accordance with the specifications given in “MODBUS over Serial Line; Specification and Implementation Guide V1.02”.

5.3.8. Ethernet (switch)

The onboard switch has 10/100 Base-T with RJ-45 connections for networking.
The switch cannot be managed.

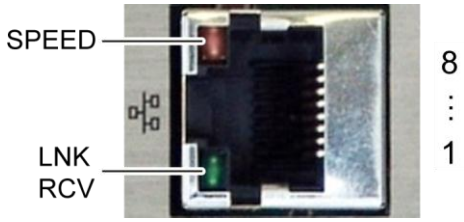

Fig. 15: Ethernet interface

Ethernet interface assignments on plugs X10, X11 and X12			
Pin	**Assignment**	**Pin**	**Assignment**
1	TX+	5	NC
2	TX–	6	RX–
3	RX+	7	NC
4	NC	8	NC

LEDs		
LED	**Colour**	**Meaning according to IEEE 802.3 clause 25**
SPEED	yellow	On = 100 Mbit/s Off = 10 Mbit/s
LNK/RCV	green	Link, Data Receive Flashing: connection active; data transfer underway Off: no connection established

5.3.9. EtherCAT

The onboard EtherCAT adapter 10/100 Base-T with RJ-45 connection enables network connection to components with synchronised data transfer in real-time.

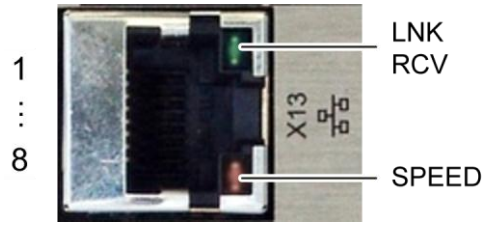

Fig. 16: EtherCAT interface

Assignment of EtherCAT interface plug X13			
Pin	**Assignment**	**Pin**	**Assignment**
1	TX+	5	NC
2	TX–	6	RX–
3	RX+	7	NC
4	NC	8	NC

LEDs		
LED	**Colour**	**Meaning according to IEEE 802.3 clause 25**
SPEED	yellow	On = 100 Mbit/s Off = 10 Mbit/s
LNK/RCV	green	Link, Data Receive Flashing: connection active; data transfer underway Off: no connection established

5.3.10. USB

Devices with a USB interface can be connected to the USB host port (Rev. 2.0). Suitable USB device classes are:

→ CODESYS user: only USB stick
→ Linux level: USB stick or mouse

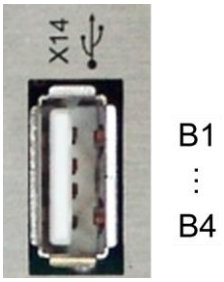

Fig. 17: USB interface

Assignment USB interface plug X14			
Pin	**Assignment**	**Pin**	**Assignment**
B1	VCC	B3	D+
B2	D–	B4	GND

NOTICE

Damage to USB stick and malfunction due to data loss!

Removing a USB stick while it is still in use and data is being transferred can result in irretrievable damage to the memory. Open files which cannot be accessed due to removal of the USB stick can block the device.

▶ Therefore ensure that all operations are complete before removing the USB stick.

NOTICE

Property damage and malfunction due to data loss!

If a USB device requires more than the available 0.5 A, the device will carry out a reset. A reset will result in immediate stoppage of the device and any connected machines or systems.

Substantial property damage and damage to the USB device may ensue.

▶ Before using a USB device, check carefully its power requirements.

The USB interface plug is designed to withstand 1,000 plugging and unplugging cycles.

6. Operation

6.1. Switching on and off

NOTICE	**Property damage** ▶ Before connecting the power supply, ensure that all cabling and the polarity of all the connections are correct.

Switching on
The device does not have an on/off switch. The device starts automatically when the system is switched on or the power is connected.

Switching off
The device is switched off when the system is switched off or the power supply is disconnected.

6.2. Network start-up

The device must be connected to the network with the correct settings before it can be used.

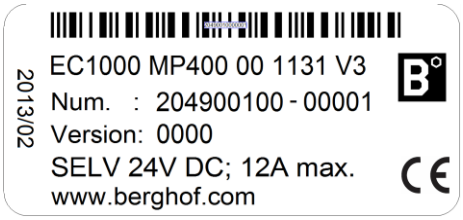

Fig. 18: identification plate with device serial number 00001 (example)

1. Note down the IP address and subnet mask:
→ IP address: 169.254.255.XX
XX corresponds to the last 2 digits of the device serial number. Exception: 00 becomes 100.
→ Subnet mask: 255.255.255.0

NOTICE	**Property damage** ▶ Before connecting the power supply, ensure that all cabling and the polarity of all the connections are correct.

2. Supply power to the device (24 V).
3. Connect the device to a programming computer using a network cable (X10) and network switch.
4. Open a web browser on the programming computer.
5. Enter the IP address of the device into the web browser.

The login screen will appear.

Fig. 19: login window

6. Use the following user name and password to log into the device:
   Name: admin
   Password: admin

The web configuration page will be displayed.

Fig. 20: list of web interface settings

7. Click on the “Network” link.

The “Network Configuration” page is displayed.

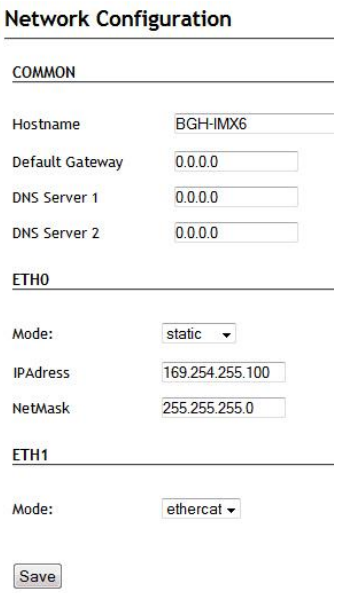

Fig. 21: “Network Configuration” page

8. Check the network settings and make any changes in the text boxes if required.
   ECC22XX configuration: ETH0 = X10…X12, ETH1 = X13
9. Save the settings by clicking on “Save”.
10. Additional settings can also be viewed and/or modified on the web configuration page (e.g. system time, display resolution, TargetVisu).
11. In order to activate all of the modified settings, reboot the device:
    Remove the device temporarily from the power supply
    – or –
    Click on “Reboot” in the web interface and then confirm on the next screen by clicking on “Reboot Module”.

The device is now configured and ready for use.

6.3. Operation

6.3.1. Status displays

The status display function is dependent on the software development environment used in conjunction with the device.

The operating status LEDs show the current status of the power supply, the module mode and any error messages.
The signals from the LEDs depend on the current operating status of the device:

→ CODESYS inactive: the firmware controls the LEDs.
→ CODESYS active: only the CODESYS runtime system (CODESYS Runtime) controls the LEDs.

Location of the operating status LEDs
The Run/Stop and Error LEDs display the system status.

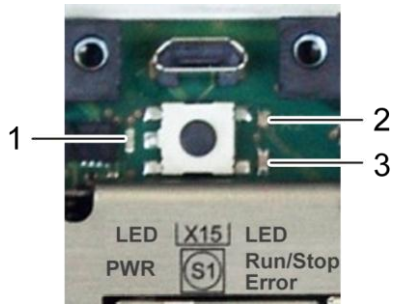

Fig. 22: location of the LEDs

LED		Meaning
1	PWR (green)	shows that the power supply to the electronics is correct.
2	Run/Stop (yellow/green/red)	shows the system statuses and CODESYS operating statuses.
3	Error (red)	shows the device has been stopped due to an error.

Meaning of the LED displays

→ System statuses are shown using flashing signals on the Run/Stop LED in yellow.
→ CODESYS operating statuses are shown via continuous illumination of the Run/Stop LED in either red or green.
→ While the Run/Stop light is flashing yellow: the device is in use and must not be switched off.
→ The device does not show warnings via the LEDs during start-up.

Run/Stop LED	Error LED	System status	Description
System statuses			
–	–	BOOTLOADER	Bootloader active
		BOOTING	Linux booting sequence active
YELLOW: flashes 1 x, 2 s pause	–	MAINTENANCE	Maintenance mode active
YELLOW: flashes slowly (1 s)	–	USB_UPDATE	Packet update via USB active
YELLOW: flashes rapidly (400 ms)	–	RUN_IN_RAM	Operating from RAM (firmware update active)
YELLOW: flashes 2 x, 2 s pause	–	NEEDS_REBOOT	Reboot required (e.g. after update).
–	RED	–	Error beyond scope of CODESYS runtime system
CODESYS operating statuses			
RED or GREEN	–	PLC_ACTIVE	CODESYS runtime system active.
RED	–	PLC_STOPPED	At least one PLC application is stopped.
		PLC_ALL_STOPPED	All PLC applications are stopped.
GREEN	–	PLC_ALL_RUNNING	All PLC applications running.
RED	RED	PLC_ERROR	At least one PLC application is stopped due to an error.
RED: flashing	–	–	RESET COLD underway.

6.3.2. Start/Stop

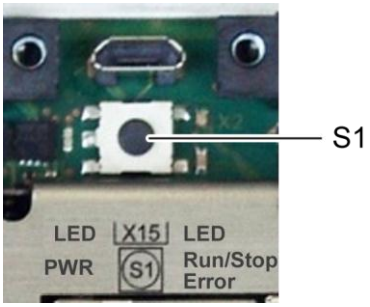

Fig. 23: function key (S1)

Function key (S1)		
Operating status	**Action**	**Command**
Bootphase	Press	Change to maintenance mode
CODESYS SPS/ CP1131-P	Press quickly	Change between PLC run and stop mode.
	Press and hold	Stop PLC with reset of variables (except retain data)

6.3.3. Real-time clock with buffer battery

Setting the time
The time can be set via the web configuration page or the “SysTimeRTC Library” CODESYS library.

Changing the battery
The battery is not designed to be changed by the user; the manufacturer should be contacted in order to change the battery.

6.3.4. microSD card

WARNING

Serious injury as a result of uncontrolled and unpredictable operational sequences!

Inserting or removing the microSD card can result in the ECC22XX malfunctioning. Failure in electronic control systems may result in uncontrolled and unpredictable operational sequences.

- ▶ Only insert or remove microSD cards with the ECC22XX switched off.

NOTICE

Loss of data!

microSD cards do not have their own write protection system.

- ▶ Ensure that no data is deleted or overwritten by accident.

Inserting a microSD card

1. Turn off the ECC22XX.
2. Insert the microSD card into the microSD card slot.
3. Turn the ECC22XX back on.

The microSD card is now ready for data transfer (read, write and copy).

Max. possible storage capacity: 32 GB.

Any write protection on the microSD card itself is ignored - data can still be overwritten.

The life cycle of the gold-plated contacts is up to 10,000 plugging and unplugging cycles.

6.4. Troubleshooting

6.4.1. In error stop mode

1. Establish cause of fault (log into device on web browser).
2. Correct the fault.
3. Restart the device.

The device is now ready for use.

6.4.2. Unknown IP address

If the IP address of the device is unknown, maintenance mode can be used to reconfigure it.

1. Reboot the device while pressing and holding S1 until the Run/Stop LED flashes every 2 seconds.

The device is now in maintenance mode and can be reached via the default IP address.

2. Connect to the device using the default IP address:

→ IP address: 169.254.255.XX
XX corresponds to the last 2 digits of the device serial number. Exception: 00 becomes 100.

3. Correct the network settings and make a note of them.
4. Restart the device.

Maintenance mode is disconnected.
The device is now configured and ready for use.

7. Maintenance/upkeep

7.1. Maintenance

If the device is used correctly it should not require maintenance.

7.2. Cleaning

- Only clean the device using a dry, lint-free cloth.
- Do not use any cleaning liquids.

8. Disassembly

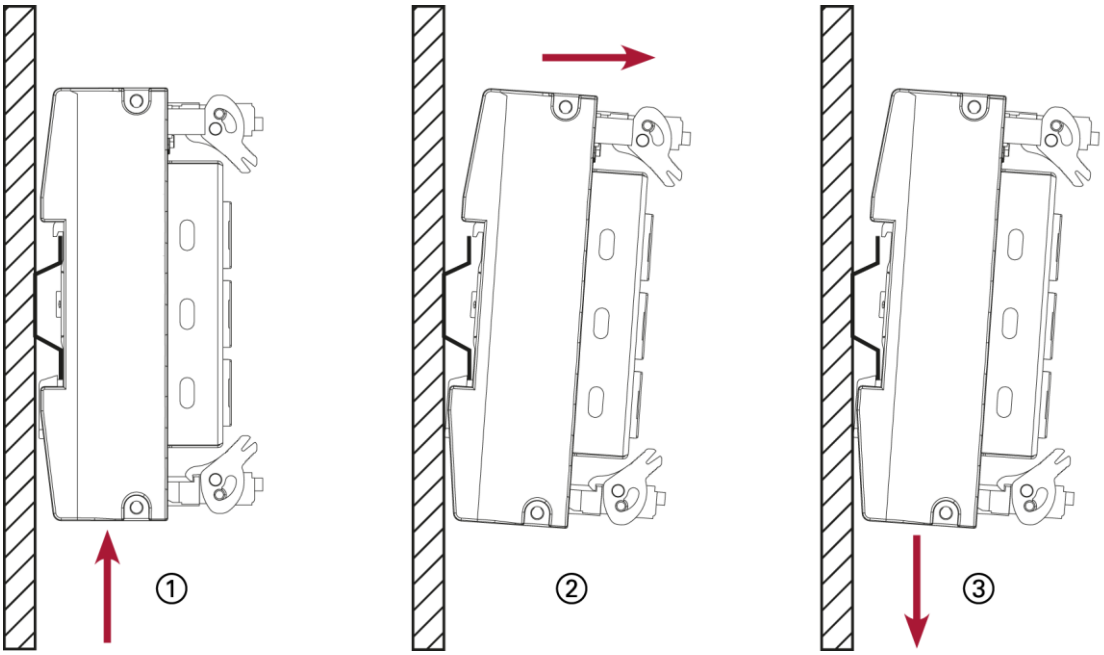

Fig. 24: disassembling the device

1. Remove the device from the support rail according to the image above by pushing it in at the bottom so that the plastic snap-in hooks on the frame are pressed in.
2. Lift the device away from the top of the support rail.
3. Push the device downwards and remove completely from the support rail.

9. Disposal

The following options are available for disposal of the device:

- At the end of the device's life cycle you can return it to the manufacturer for a set fee. The manufacturer will then deal with the recycling of the device.
- Dispose of the device according to regional specifications.

10. Technical data

10.1. EC controller

Ethernet controller	ECC2250	ECC2251
Device data		
Name	ECC2250 1131	ECC2251 1131
Article no.	2500000100	2250000300
Programming tool	At least CODESYS V3.5	
Assembly	Support rail NS 35/7.5 EN 50022	
I/O expansion	none	
CPU, user memory		
CPU	Freescale i.MX6 CPU max. 800 MHz Single Core	
Program memory (flash)	256 MB onboard / 100 MB for application	
Program memory and data memory (RAM)	256 MB onboard / max. 128 MB for application	
Retain memory	100 kB	
Dimensions and weight		
Dimensions (WxHxD [mm])	210 x 106 x 48	
Weight	approx. 750 g	
Operating conditions		
Operating temperature	0°C to 55°C (to comply with installation requirements)	
Relative humidity	max. 85%, non-condensing	
Transport and storage		
Operating temperature	–20°C to +70°C	
Relative humidity	max. 85%, non-condensing	
Shock resistance		
Vibration	sinusoidal (EN 60068-2-6) test: Fc 10 ... 150 Hz, 10 m/s²	
Shock	15 G (approx. 150 m/s²), 11 ms duration, sinusoidal half-wave (EN 60068-2-27) test: Ea	
Shock resistance		
Emitted interference	EN 61000-6-3, residential areas	
Resistance to interference	EN 61131-2; EN 61000-6-2, industrial areas	

Ethernet controller	ECC2250	ECC2251
Protection class	III	
Insulation resistance	SELV (Ue < 30 V) acc. to EN 61131-2	
Protection rating	IP20	
Power supply (24 V power)		
Supply voltage	+24 VDC (–20% / +25%) SELV max. Alternating current proportion 5%	
Power consumption	typ. 0.3 A, max. 1 A at +24 VDC (L+ - internal power supply), Supply DI/O (L1+…L4+) max. 2 A per group	
Protection against reverse polarity	yes	
Potential isolation	no	
Voltage failure switching	10 ms at < 20.4 VDC Power Fail < 19.2 VDC	
Ethernet interfaces		
No. / type of interface	1x 10/100 Base T or 3x 10/100 Base T via switch	
Connection system	RJ45 (max. 1-3)	
EtherCAT interfaces		
No. / type of interface	1x EtherCAT via Ethernet interface	
Connection system	RJ45	
USB interface		
No. / type of interfaces	1x Host USB Rev. 2.0	
No. plugging/unplugging cycles	max. 1,000	
CAN bus interfaces		
No. / type of interfaces	1x CAN / RJ45	none
Potential isolation	yes (electrical isolation)	–
Transmission rate	ISO 11898 max. 1 Mbit/s	–
Terminal resistance	connectible via switch	–
Serial interfaces		
No. / type of interfaces	1x RS 232; 2 x RS 485; RJ-J45; assignment according to Modbus specifications	
Potential isolation	1x RS 485; 1x RS 485 and 1x RS 232 electrical isolation	
Transmission rate	max. baud rate 115 kBaud	
Additional functions		

Ethernet controller	ECC2250	ECC2251
Real-time clock	yes, buffered (maintenance-free)	
microSD card slot	1x microSD card (SD or SDHC up to 32 GB) Max. life span 10,000 plugging/unplugging cycles	
I/O		
Digital inputs	16 x (general purpose input), type 1+3 acc. to EN 61131-2;	
Digital outputs	4x4; 0.5 A per output; each group with own power supply;	
Analogue inputs	6 A inputs (voltage ±10 V; current ±20 mA; PT100/1000 – 2-wire) 6 B inputs (voltage ±10 V; current ±20 mA) (alternatively the adjacent A+B inputs can also be used as 1 PT100/1000 3-wire input)	
Analogue outputs	6x voltage; 0–10 V; 12 bit resolution	
Battery		
Type	Panasonic VL2020 or similar	
Life span	10 years (depends on operating temperature)	
Storage	1 year without voltage (any longer and RTC data can be lost)	

Further information on the battery can be found on the manufacturer’s web site (e.g.: http://www.panasonic.com/industrial/batteries-oem/…).

10.2. Identification plate

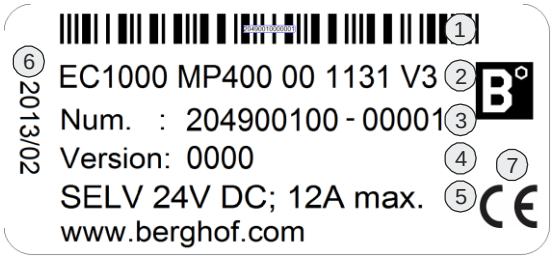

Fig. 25: ECC22XX identification plate

Item	Description	Item	Description
1	Bar code (identification no.)	5	Supply voltage
2	Device type description	6	Date of manufacture (year/calendar week)
3	Identification no. (article no. and serial no.)	7	CE marking
4	Version (delivery version; as-delivered condition)		

10.3. Identification

The characteristics of the Ethernet controller can be found with the help of the identification key.

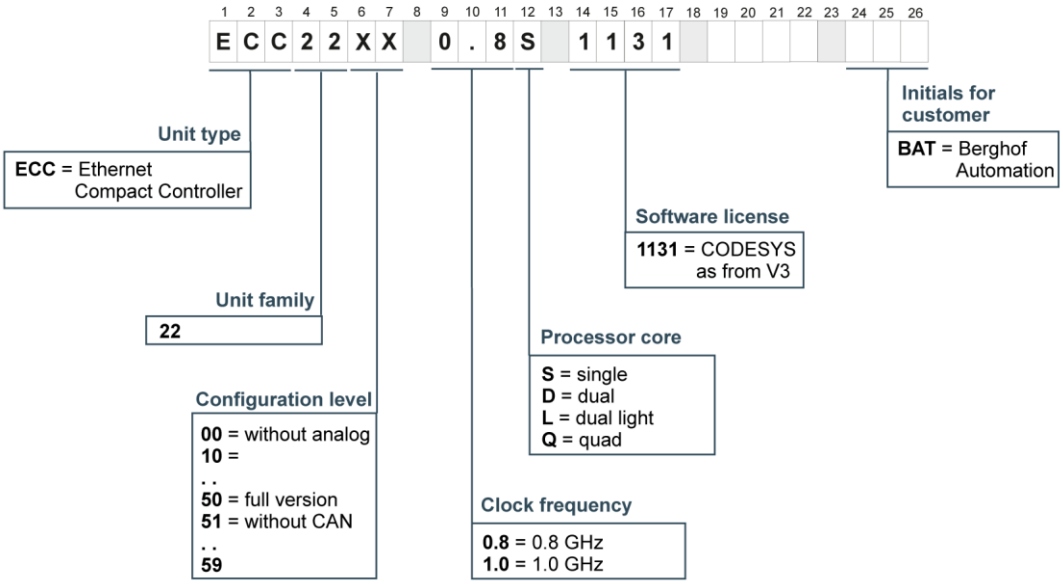
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
E C C 2 2 X X 0 . 8 S 1 1 3 1
Unit type
ECC = Ethernet Compact Controller
Unit family
22
Configuration level
00 = without analog
10 =
. .
50 = full version
51 = without CAN
. .
59
Processor core
S = single
D = dual
L = dual light
Q = quad
Clock frequency
0.8 = 0.8 GHz
1.0 = 1.0 GHz
Software license
1131 = CODESYS as from V3
Initials for customer
BAT = Berghof Automation

Fig. 26: identification key

11. Standards and certificates

11.1. Standards

Applicable directives

→ EMC directive 2004/108/EC

Applicable standards

→ PLC standard EN 61131-2:2008-4
→ Emission standards EN 61000-6-3:2012-11
→ Safety regulations EN 61010-2-201

11.2. UL certificate

NOTICE OF COMPLETION
AND
AUTHORIZATION TO APPLY THE UL MARK

08/08/2014

Berghof Automationstechnik Gmbh
Mr. UWE MANZOW
Harretstrasse 1
Eningen Baden-wuerttemberg 72800, De

Our Reference:	File E242595, Vol. 1	Project Number	4786273972
Your Reference:	Auftrag: 2336989 / Bestell-Nr.: 30741		
Project Scope:	cULus Full Certification to UL 61010-2-201 of Programmable Logic Controllers, Series EC COMPACT, models ECC, followed by 22, followed by 00..99, followed by blank, followed by 0.8 or 1.0, followed by S, D, L or Q, followed by blank, may be followed by 1131, may be followed by additional suffixes.		

Dear Mr. UWE MANZOW:

Congratulations! UL's investigation of your product(s) has been completed under the above Reference Number and the product was determined to comply with the applicable requirements. This letter temporarily supplements the UL Follow-Up Services Procedure and serves as authorization to apply the UL Mark at authorized factories under UL's Follow-Up Service Program. To provide your manufacturer(s) with the intended authorization to use the UL Mark, you must send a copy of this notice to each manufacturing location currently authorized under File E242595, Vol. 1.

Records in the Follow-Up Services Procedure covering the product are now being prepared and will be sent in the near future. Until then, this letter authorizes application of the UL Mark for 90 days from the date indicated above.

Additional requirements related to your responsibilities as the Applicant can be found in the document “Applicant responsibilities related to Early Authorizations” that can be found at the following web-site:
http://www.ul.com/EAResponsibilities

Any information and documentation provided to you involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL.

We are excited you are now able to apply the UL Mark to your products and appreciate your business. Feel free to contact me or any of our Customer Service representatives if you have any questions.

Very truly yours,

Stefan Giebeler
+49-69-489 810 210
Staff Engineer
Stefan.Giebeler@ul.com

Reviewed by:

William R. Carney
847/664-1088
Chief Engineer Director I
William.R.Carney@ul.com

NWTEFDC-1DE9EA

This is an electronically generated letter. Signatures are not required for this document to be valid.

Page 1 of 1

The devices are authorised to use the following mark:

Fig. 27: cULus authorisation

The devices have been awarded cULus authorisation according to standard UL 61010-2-201 NRAQ /7.

Link:

→ http://database.ul.com/cgi-bin/XYV/cgifind.new/LISEXT/1FRAME/index.html

→ UL File Number: E242595

11.3. Declaration of conformity

ZERTIFIKAT / CERTIFICATE S. 1/1

EG-Konformitätserklärung
Declaration of conformity

Hiermit erklären wir in alleiniger Verantwortung, dass die nachstehend bezeichneten Geräte in ihrer Konzeption und Bauart sowie in der von uns in Verkehr gebrachten Ausführung der EG-Richtlinie 2004/108/EG entsprechen. Bei einer mit uns nicht abgestimmten Änderung der Geräte verliert diese Erklärung ihre Gültigkeit.

We hereby declare, that the following described modules in their conception, construction and form are in compliance with the EC directive 2004/108/EEC. In case of any alteration of the modules, not certified by us, this declaration is void.

Hersteller / manufacturer	Berghof Automation GmbH Harretstrasse 1 D-72800 Eningen
Produktbezeichnung / product name	**ETHERNET CONTROLLER ECC22XX**
Produktnummer / product number	**250000100 250000300 252200100**

Es wird die Übereinstimmung mit folgenden EG-Richtlinen und Normen erklärt:
The requirements of the following EC directives and standards are met:

Angewandte Richtlinien / applied directives

EMV-Richtlinie	2004/108/EU

Angewandte Normen / applied standards

Produktnorm SPS	EN61131-2:2008-4
Fachgrundnorm: Störaussendung Wohnbereich	EN61000-6-3:2012-11
Sicherheitsbestimmungen	EN61010-2-201:2014-01

18.08.2014	Franz Ott	Uwe Manzow
Datum Date	Geschäftsführer Berghof Automation GmbH Chief Executive Officer Berghof Automation GmbH	Projektingenieur Project Manager

BERGHOF

Berghof Automation GmbH | Harretstrasse 1 | 72800 Eningen | www.berghof.com
21-0099-88-10-02-032 | Dokument1

12. Customer services / addresses

Repairs and corrective maintenance may only be carried out by the manufacturer or authorised customer service centres.

12.1. Customer services

Berghof Automation GmbH
Harretstr. 1
72800 Eningen
Germany
T +49 7121 894 183
F +49 7121 894 100
e-mail: support-controls@berghof.com
www.berghof.com

12.2. Addresses

CAN in Automation; international manufacturer and user organisation for CAN users in automation:
CAN in Automation e.V. (CiA)
Am Weichselgarten 26
91058 Erlangen
headquarters@can-cia.de
www.can-cia.de

EtherCAT Technology Group
ETG Headquarters
Ostendstraße 196
90482 Nürnberg
info@ethercat.org
www.ethercat.org

Beuth Verlag GmbH, 10772 Berlin
or
VDE-Verlag GmbH, 10625 Berlin

VDE Verlag GmbH, 10625 Berlin
or
Internet research: www.iec.ch

13. Appendix

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